

## Contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
1.1	Current Landscape of Multimessenger Science . . . . .	6
1.1.1	sub sub example . . . . .	6
1.1.1.1	subsubsub = paragraph . . . . .	7
1.2	Multimessenger Science in the Next Two Decades . . . . .	7
<b>2</b>	<b>Astrophysics Theory &amp; Phenomenology</b>	<b>8</b>
2.1	Gravitational Waves and Gamma Rays . . . . .	8
2.1.1	Stellar Mass Compact Object Binaries . . . . .	8
2.1.1.1	White Dwarf-White Dwarf . . . . .	8
2.1.1.2	Neutron Star-Neutron Star . . . . .	8
2.1.1.3	Neutron Star-Black Hole . . . . .	8
2.1.1.4	Black Hole-Black Hole . . . . .	8
2.1.2	Massive Compact Object Binaries . . . . .	8
2.1.2.1	Massive Black Hole Binaries . . . . .	8
2.1.2.2	Intermediate and Extreme Mass Ratio Inspirals . . . . .	8
2.2	Neutrinos and Gamma Rays . . . . .	8
2.2.1	Active Galactic Nuclei . . . . .	8
2.2.1.1	Jetted AGN . . . . .	8
2.2.1.2	Unjetted AGN . . . . .	8
2.3	GWs, Neutrinos, and Gamma Rays . . . . .	8
2.3.1	Tidal Disruption Events . . . . .	8
2.4	Other Transients . . . . .	9
2.4.1	Long Gamma-Ray Bursts . . . . .	9
2.4.2	Fast Radio Bursts . . . . .	9
2.4.3	something else . . . . .	9
2.5	Cosmic Rays, Gamma Rays, and Neutrinos – Non-transient Phenomena . . . . .	9
2.5.1	Supernova Remnants . . . . .	9
2.5.2	Pulsars . . . . .	9
2.5.3	Pulsar Wind Nebulae . . . . .	9
2.6	Diffuse Backgrounds . . . . .	9
2.6.1	Diffuse Gamma-ray Background . . . . .	9
2.6.2	Diffuse Astrophysical Neutrino Background . . . . .	9
2.6.3	Cosmic Ray Spectrum . . . . .	9
2.6.4	Stochastic Gravitational Wave Background . . . . .	9
2.7	Searches for Beyond-Standard-Model and Tests of Fundamental Physics . . . . .	10
2.7.1	Cosmology . . . . .	10
2.7.1.1	Hubble Constant Tension . . . . .	10
2.7.2	Dark Matter Detection . . . . .	10
2.7.3	Primordial Gravitational Waves . . . . .	10
2.7.4	Early Universe Processes . . . . .	10
2.7.5	Lorentz Invariance Violation . . . . .	10

<b>3</b>	<b>The Current and Future Multimessenger Network</b>	<b>11</b>
3.1	The Current Landscape . . . . .	11
3.2	The Multimessenger Vision . . . . .	11
3.3	Facilities . . . . .	11
3.3.1	List of Facilities . . . . .	11
3.3.2	Complimentarity between Facilities . . . . .	11
<b>4</b>	<b>Take Away Conclusions</b>	<b>12</b>
4.1	sample . . . . .	12
4.1.1	sub sub example . . . . .	12
4.1.1.1	subsubsub = paragraph . . . . .	13